REMARKS

Applicant respectfully requests reconsideration of this Application in light of the foregoing amendments and the following remarks. In a first Office action mailed 11/03/2005, claims 1-15 were pending. Claims 1-15 were rejected as anticipated by US 5,455,926 (Keele). Claim 14 was objected to and stated as allowable if rewritten in independent form. Accordingly, Applicants amended claim 14, cancelled the remaining claims without prejudice and requested the Application be passed to issuance.

In a second Office action mailed 05/12/2006, however, the allowability of claim 14 was withdrawn and claim 14 now stands rejected as anticipated by US 2004/0098244 (Dailey). In view of the examiner's change in position on claim 14, Applicants have canceled claim 14 and added new claims 16-24. Support for these new claims is provided by previously canceled claims 1-15 and by Applicants' specification and figures, as noted below.

For ease of reference, Applicants patentably distinguish these new claims from Keele and Dailey with respect to the rejections asserted in both the first and second Office actions. All references below are to the first Office action unless specifically stated as "second Office action."

In General

Conventional sequential stackers are well-known for automatic data back-up and retrieval applications. A conventional sequential stacker has a tape drive, tape cartridge slots and a robotic mechanism that moves tapes between the slots and the tape drive. Unlike a tape library, a stacker's robotic mechanism autoloads tape cartridges between the tape drive and the tape cartridge slots in a predetermined sequential order. In this manner, many automatic backup events are addressed, rather than daily, by a once weekly or longer operator action of unloading/loading the cartridge slots with tape cartridges. By reducing the frequency of human involvement, the sequential stacker eliminates the opportunity for human error or neglect. The sequential stacker described above utilizes <u>physical</u> tape cartridges loaded into a <u>physical</u> tape drive. Applicants' claims, discussed in detail below, are to a <u>virtual</u> tape stacker having, for example, a plurality of <u>virtual</u> tape volumes that are sequentially

loaded/unloaded into a <u>virtual</u> tape drive. Keele and Dailey do not disclose or describe a conventional sequential stacker, much less a virtual tape stacker.

Keele describes a controller that emulates a single type of tape storage (IBM 3480) having an optical disk jukebox. In particular, Keele describes a mechanism whereby physical storage media (optical disks) are loaded into physical drives under host server or operator control. Dailey also describes a physical media (data cartridges) that house either tape or non-tape storage media. The data cartridges plug into a physical device (controller) call a tape drive emulator. Keele describes a structure (Fig. 5) for defining multiple virtual tapes on an optical disk. Dailey does not teach or disclose virtual tape volumes, i.e. Dailey describes a data structure only suitable for managing a single "tape volume" within each data cartridge. This is not surprising as the Dailey data cartridge is intended to appear as a convention data tape cartridge (physical tape volume). See Dailey paragraph [0043].

Neither Keele nor Dailey disclose or describe a virtual tape drive that loads and unloads virtual tape volumes. Keele's virtual tapes are loaded in mass via optical disk into a physical optical disk drive. Dailey teaches a single physical tape volume (data cartridge) that loads into a physical controller (tape storage emulator) and may have sequential tape data stored on random access media, such as a hard disk drive.

As such, the first and second Office actions both fail to distinguish <u>virtual</u> storage media from <u>physical</u> storage media and <u>virtual</u> tape drives from <u>physical</u> media drives and controllers. That is, neither Keele nor Dailey read on a virtual tape stacker that, for example, sequentially autoloads virtual tape volumes into a virtual tape drive in response to eject commands.

Claim Rejections - 35 USC § 102

FIGS. 4, 6 & 8A-B from the Application are reproduced below to illustrate claim aspects that overcome the rejections cited above and distinguish the art of record.

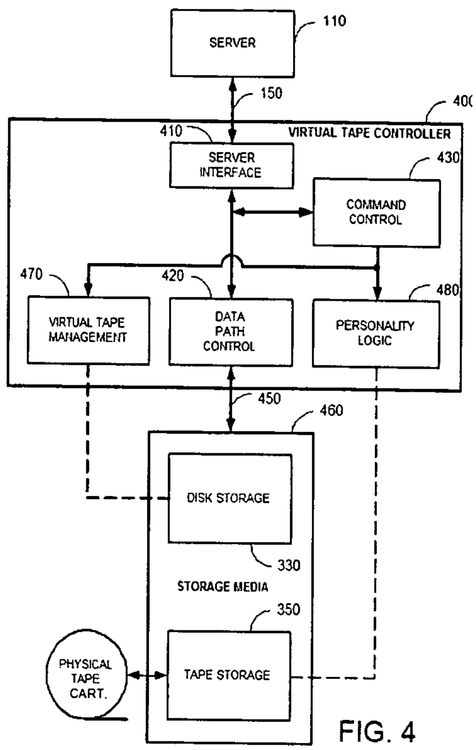

FIG. 4

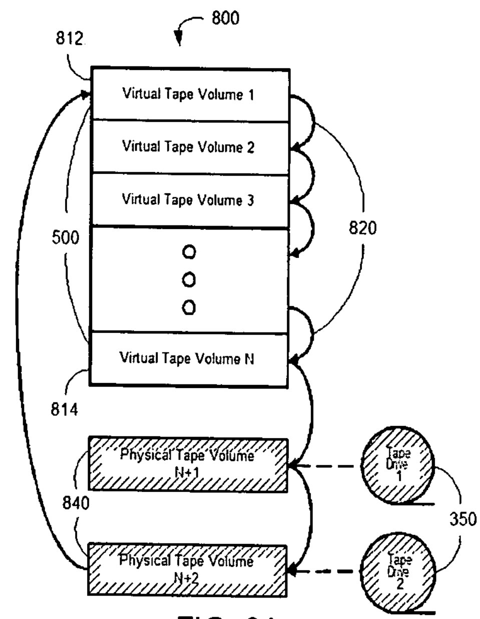

FIG. 8A

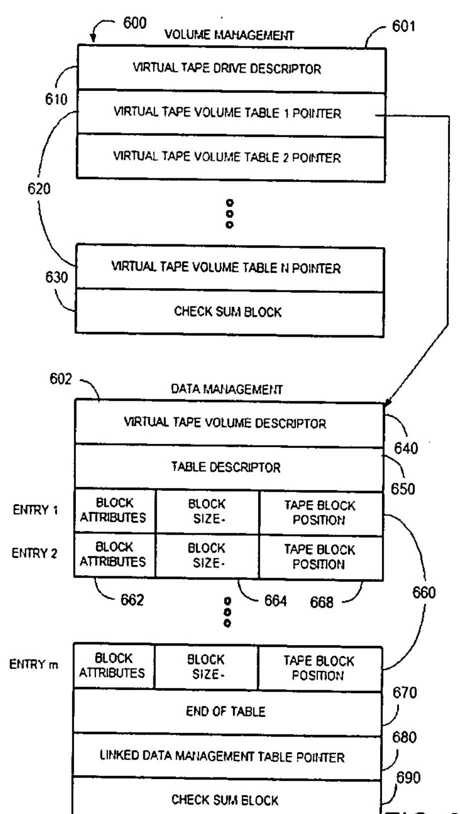

FIG. 6

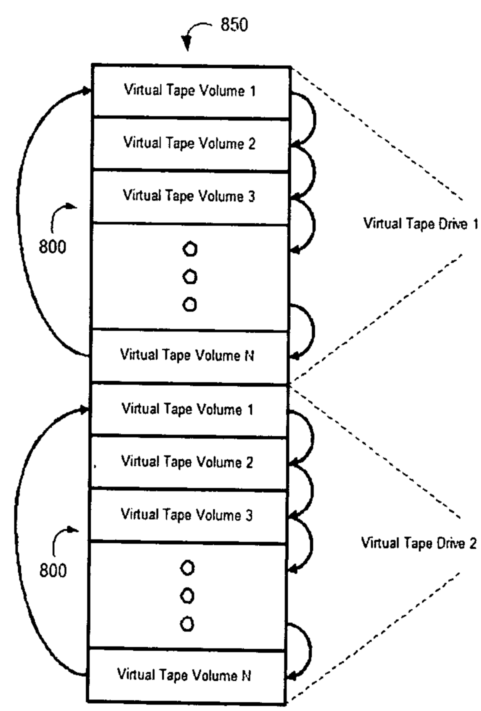

FIG. 8B

Claims 16-18

Claim 16 cites:

> A virtual tape stacker comprising:
> a server interface 410 adapted to communicate with a server;
> a random access data storage device 330;
> a data path 450 adapted to communicate with the random access data storage device; and
> a controller 400 configured to transfer data between the server interface and the random access data storage device via the data path,
> wherein the controller manages the data on the random access data storage device as a plurality of virtual tape volumes 500,
> wherein the controller defines a virtual tape drive (FIG. 8B) for transferring data between the server and the virtual tape volumes, and
> wherein the controller defines a sequential order 820 for loading the virtual tape volumes into the virtual tape drive, and
> wherein, in response to an eject command from the server, the controller unloads one of the virtual tape volumes from the virtual tape drive and loads a next consecutive one of the virtual tape volumes into the virtual tape drive according to the sequential order.

Reference numerals added with respect to FIGS. 4, 6 and 8A-B, reproduced above.

Keele does not disclose a <u>sequential order for loading virtual tape volumes into a virtual tape drive</u> nor <u>loading a next consecutive virtual tape volume</u> in response to an <u>eject command</u>. The Specification describes a tape stacker:

> As shown in FIG. **8A**, a virtual sequential stacker **800** has multiple <u>virtual tape volumes **500** organized in a sequential order **820**</u>. The first virtual tape volume **812** is automatically "mounted" into the virtual tape drive by default. Once a virtual tape volume **500** is mounted, it behaves and operates as if it was loaded in a conventional tape drive. <u>If the application program **130** (FIG. 3) unloads a virtual tape volume **500**, the next consecutive virtual tape volume **500** is automatically loaded</u>.

Specification paragraph [0034], emphasis added.

With respect to canceled claim 1, the Office action equates sequentially-ordered virtual tape volumes with "sectors which can be written and read sequentially." Office action page 4, paragraph 8. This confuses physical media (optical disk sectors) with virtual media (virtual tape volumes). Further, the Office action equates loading a next consecutive virtual tape volume with "the jukebox mounts or dismounts the disks into the optical drives." Office action page 5, paragraph 8. This confuses loading a physical drive (jukebox) with loading a virtual drive. As discussed above, Keele does not

disclose or describe a virtual tape drive construct, much less a virtual tape drive that sequentially loads virtual tape volumes. Accordingly, claim 16 patentably distinguishes Keele.

Similarly, claim 16 patentably distinguishes Dailey, which also merely discloses physical media (data cartridge) loaded into a physical controller device termed the tape drive emulator 6 (Dailey Fig. 1). As discussed above, Dailey does not disclose a plurality of virtual tape volumes, but rather random access tape data stored within a physical data cartridge intended to appears as single tape cartridge volume, such as the "9490EE magnetic storage tape cartridge . . ." Dailey paragraph [0043]. As such, Dailey does not disclose a virtual tape drive or a plurality of virtual tape volumes, much less a virtual tape drive that sequentially loads virtual tape volumes.

Claims 17 and 18, which depend from claim 16 are likewise not anticipated by Keele or Dailey. Claims 17 and 18 are not anticipated by Keele or Dailey for the additional reasons discussed immediately below.

Claim 17 cites:

> The virtual tape stacker according to claim 16 further comprising:
>
> a volume management table 601 residing on the random access storage device and accessible by the controller, the volume management table having pointers 620 to the virtual tape volumes; and
>
> a virtual tape manager 470 residing on the controller that accesses the pointers so as to determine the next consecutive one of the virtual tape volumes.

Reference numerals added with respect to FIGS. 4 and 6, reproduced above. See also FIG. 5B, numerals 601 and 602.

> FIG. **6** illustrates a lookup table **600** having a <u>volume management lookup table</u> **601** and one or more data management lookup tables **602**. The volume management table **601** manages an entire disk storage space **501** (FIGS. **5B-C**) spanning one or more disk drives. Each of the data management tables **602** manages a corresponding individual virtual tape volume **500** (FIGS. **5A-C**). The volume management table **601** has a virtual tape drive descriptor **610**, one or more <u>virtual tape volume pointers</u> **620** and a check sum block **630**. ... The pointers **620** contain the starting LBA of each data management table **602**.

Specification paragraph [0028]. See also Specification paragraph [0070] ("If the previous virtual tape volume was not the last volume **2335**, then the next virtual data management table is loaded **2340**.")

Keele does not disclose a volume management table that has pointers to the virtual tape volumes. Further, Keele does not disclose a virtual tape manager that accesses the pointers to determine the next consecutive virtual tape volume to load.

With respect to canceled claim 2, the Office action equates a volume management table having pointers to the controller which "stores tape maps of the virtual tapes" and adds that the "tape map pointer points to a respective tape map." Office action page 5, paragraph 9. The Keele tape map, however, merely provides information regarding "BOT. EOT, IBG and TM" and "where the individual user records are stored on the disk." Keele column 44, lines 11-15. The Keele controller does not access either the tape map pointer or the tape map itself to determine a next consecutive virtual tape volume to be loaded into a (physical) optical disk drive. Rather, Keele teaches that each virtual tape to be loaded must be specified by the host computer or the operator, and the disk directory that manages those virtual tapes is required to be stored on a controller-based hard drive separate from the virtual tapes (stored on optical disk):

> When the host computer or an operator requests a certain volume serial number (VSN), MOST must determine which physical optical disk is required, its location and orientation. This requires that a disk directory be maintained by MOST. The disk directory which keeps track of virtual tapes is stored on the Winchester hard drive 50.

Keele column 35, lines 2-8. For all of the above stated reasons, claim 17 further patentably distinguishes Keele.

Claim 18 cites:

> The virtual tape stacker according to claim 17 further comprising:
> a physical tape device 350 attached to the controller;
> a tape cartridge 840 loadable into the physical tape device,
> wherein a physical tape volume corresponding to the tape cartridge is integrated into the virtual tape volume storage rotation 800.

Reference numerals added with respect to FIGS. 8A-B, reproduced above. See also:

> As shown in FIG. **8A**, one or more physical tape drives **350** may be incorporated into the virtual sequential stacker **800**. The VTC **400** (FIG. **4**) monitors any physical tape drive **350** that is present. If a physical tape cartridge is manually loaded into a tape drive **350** and it is "Write Protected," the virtual tape management **470** (FIG. **4**) enables the application program **130** (FIG. **3**) to access the tape data directly. The physical tape volume **840** automatically becomes part of the virtual tape volume storage rotation.

Specification paragraph [0034].

Keele does not disclose a physical tape device or a physical tape volume integrated into a virtual tape volume storage rotation. With respect to canceled claim 3, the Office action equates the Keele optical disk and jukebox to a physical tape device, with the only justification that: "The function of the jukebox is to store disks in physical slots." Office action page 6, paragraph 9. The Keele optical disk drive, however, is not a physical tape device. The Office action continues this assertion: "Keele teaches . . . that the controller may have attached devices such as 3480 cartridge tape, 3420 reel tape . . ." Office action page 6, paragraph 9. This, however, is not what Keele discloses. Rather, Keele states that:

> The MOST controller is a software and microcode controlled device. This provides flexibility in that the controller together with it attached devices can emulate different standard channel attached devices (3480 cartridge tape, 3420 reel tape . . .).

Keele column 24, lines 13-17. That is, Keele teaches away from an attached physical tape device. See also Keele Fig. 1 which illustrates the MOST Controller does not attach to any physical tape device. Nowhere in Keele is there mention that the MOST Controller communicates with a tape storage device. Further, the Keele tape map 348 (Fig. 5) and description thereof are entirely devoid of any mention of integrating physical tape volumes into a stacker arrangement of virtual tape volumes. That is, the Keele disclosure falls far short of reading on a physical tape volume that is integrated with virtual tape volumes as claimed. For the above stated reasons, claim 18 further patentably distinguishes Keele.

Claims 19-21

Claim 19 cites:

A virtual tape stacker method comprising:
providing a plurality of virtual tape volumes 500 on a random access storage device 330;
defining a virtual tape drive 610 in a volume management table 601 located on the random access storage device;
identifying the virtual tape volumes in a plurality of data management tables 602 located on the random access storage device;
storing in the volume management table a plurality of pointers 620 to the data management tables so as to identify the location of the virtual tape volumes on the random access storage device; and
predetermining an access order for the pointers so as to define a sequential order for loading the virtual tape volumes into the virtual tape drive in response to eject commands from a server.

Reference numerals added with respect to FIGS. 4 and 6.

Keele does not disclose defining a virtual tape drive or predetermining an access order for pointers, or defining a sequential order for loading the virtual tape volumes in the virtual tape drive. As argued with respect to claim 16, above, Keele does not disclose a virtual tape drive, much less a sequential order for loading virtual tape volumes into a virtual tape drive. With respect to canceled claim 12, the Office action equates "said sequential order determined by a predetermined access order of said pointers" to a combination of optical disk "sectors which can be written and read sequentially" and a "system of pointers loaded in memory of the controller so that search operations can be quickly executed." Office action page 14, paragraph 18. Simply put, sequentially accessing physical sectors on an optical disk does not anticipate a sequential order for loading virtual tape volumes into a virtual tape drive. Likewise, pointers for quick search operations do not anticipate a predetermined access order for pointers that define that sequential loading order.

Similarly, claim 19 patentably distinguishes Dailey, which, as argued above, does not disclose either a virtual tape drive or a plurality of virtual tape volumes, much less sequentially loading virtual tape volumes into a virtual tape drive in response to eject commands from a server. The second Office action refers to Dailey's library system. Second Office action page 4. Dailey's description of that system is terse: "the tape drive emulators may conform to . . . conventional tape drives that may readily be

inserted within a drive bay of library systems." Dailey paragraph [0085]. In this respect, Dailey teaches away from virtual tape volumes sequentially loaded into a virtual tape drive. Rather, Dailey discloses multiple tape drive emulators (controllers) integrated into a library system in lieu of conventional (physical) tape drives.

As such, claim 19 patentably distinguishes both Keele and Dailey. Claims 20 and 21, which depend from claim 19 are likewise not anticipated by Keele or Dailey. Claims 20 and 21 are not anticipated by Keele or Dailey for the additional reasons discussed immediately below.

Claim 20 cites:

> The virtual tape stacker method according to claim 19 further comprising:
> reading one of the pointers 620 according to the access order;
> locating one of the data management tables 602 according to the read pointer; and
> addressing a next consecutive one 820 in the sequential order of the virtual tape volumes 500 according to the located one of the data management tables.

Reference numerals added with respect to FIGS. 6 and 8A. See also

> The pointers **620** contain the starting LBA of each data management table **602**. The check sum block **630** verifies the integrity of the volume management table data.
>
> As shown in FIG. **6**, a data management table **602** has a virtual tape volume descriptor **640**, a table descriptor **650**, multiple table entries **660**, an end of table **670** and a check sum block **680**. The volume descriptor **640** stores LBAs corresponding to the virtual tape volume BOT and EOT **502**, **504** (FIG. **5A**), an indication of the virtual tape volume status as full or empty, and the LBA of the start of the early warning zone.

Specification paragraphs [0028]-[0029].

Keele does not disclose addressing a next consecutive virtual tape volume according to a located data management table. With respect to canceled claim 8, the Office action equated a similar limitation with:

> when a virtual tape is mounted, the tape map is read and if it has been altered, is written onto the disk . . . the pointer to the tape map is recorded in the tape directory for each virtual tape as a way of accessing, reading and updating pointers every time a virtual volume is loaded on a disk.

Office action page 10, paragraph 13. As argued with respect to claim 17, above, the Keele controller cannnot access the tape map pointer or the tape map itself to determine what virtual tape is to be loaded into the (physical) optical disk drive. Further, all virtual tapes on a Keele optical disk are loaded into the disk drive at once. As such, claim 20 further patentably distinguishes Keele.

Claim 21 cites:

> The virtual tape stacker method according to claim 20 further comprising:
> providing a physical tape volume 840 loaded on a physical tape device 350; and
> integrating the physical tape volume in a storage rotation of the virtual tape volumes.

Reference numerals added with respect to FIG. 8A. As argued above with respect to claim 18, Keele does not disclose a physical tape device or a physical tape volume integrated into a virtual tape volume storage rotation, and, as such, claim 21 further patentably distinguishes Keele.

Claims 22-24

Claim 22 cites:

> A virtual tape stacker comprising:
> a plurality of virtual tape volumes configured on a random access data storage device;
> a virtual tape drive defined by a controller in communications with the random access data storage device;
> a virtual tape manager configured on the controller so as to transfer data between one of the virtual tape volumes loaded into the virtual tape drive and an application program,
> wherein the virtual tape manager indicates a sequential order for loading a next consecutive one of the virtual tape volumes into the virtual tape drive upon ejection of the loaded one of the virtual tape volumes.

As argued with respect to claims 16 and 19, above, Keele does not disclose <u>a virtual tape drive</u> or a <u>sequential order for loading the virtual tape volumes upon ejection</u>. Also argued with respect to claims 16 and 19, above, Dailey does not disclose either a <u>plurality of virtual tape volumes</u> or a <u>virtual tape drive</u>, much less <u>sequential order for loading the virtual tape volumes upon ejection</u>. As such, claim 22 patentably distinguishes both Keele and Dailey. Claims 23 and 24, which depend from claim 22 are likewise not anticipated by Keele or Dailey. Claims 23 and 24 are not anticipated by Keele or Dailey for the additional reasons discussed immediately below.

Claim 23 cites:

> The virtual tape stacker according to claim 22 further comprising:
> a volume management table maintained in the virtual tape manager,
> a plurality of pointers to the virtual tape volumes stored in the volume management table,
> wherein the sequential order of loading the virtual tape volumes into the virtual tape drive is determined by an access order of the pointers.

As argued with respect to claim 19, above, Keele does not disclose <u>an access order for pointers</u> or <u>a sequential order for loading virtual tape volumes</u> determined by the access order. As argued with respect to claim 16, above, Keele does not disclose a <u>virtual tape drive</u>, much less a sequential order for <u>loading virtual tape volumes into a virtual tape drive</u>. As such, claim 23 further patentably distinguishes Keele.

Claim 24 cites:

> The virtual tape stacker according to claim 23 further comprising:
> a physical tape volume,
> wherein a last one of the virtual tape volumes is previous to the physical tape volume in the sequential access order and a first one of the virtual tape volumes is next from the physical tape volume in the sequential access order.

As argued above with respect to claim 18, Keele does not disclose a physical tape device or a physical tape in a sequential access order with virtual tape volumes. As such, claim 24 further patentably distinguishes Keele.

With respect to canceled claim 14, the second Office action asserts that Dailey "discloses a tape drive emulator that contains conventional tape cartridges (physical volumes) and non-tape storage media (logical tape volumes) all stored within the same logical storage areas." Second Office action page 5. Applicants respectfully traverse that assertion. The term "volume" is used but once in Dailey. See paragraph [0075] ("high-volume applications"). Indeed, as argued above, the Dailey data cartridge structure teaches away from a multiple tape volume structure. Although Dailey does describe a library system 70 (Fig. 10), nothing in the description discloses that the library system loads the data cartridges in any sort of order, much less an order that incorporates a last virtual tape volume previous to a physical tape volume or a first virtual tape volume next from a physical tape volume. As such, claim 24 further patentably distinguishes Dailey on these grounds.

Summary

In light of the foregoing amendments and remarks, Applicants respectfully submit that claims 16-24 are in condition for allowance. Applicants request that these claims and this application be passed to issuance. If the Examiner believes that any issue remains that requires clarification, however, the Examiner is invited to call the undersigned attorney of record at the number indicated below.

Respectfully submitted,

LAW OFFICE OF GLENN R. SMITH

Dated: 11/13/2006 By: Glenn R. Smith

Glenn R. Smith, Esq.
Registration No. 38,308
Attorney of Record
28626 Brookhill Road
Trabuco Canyon, CA 92679-1163
Telephone/Fax: (949) 709-7164